In re Appln. of Akiyo at al. Application No. Unassigned

REMARKS

The foregoing Amendment corrects translational errors and conforms the claims to United States practice. No new matter is added.

Respectfully submitted,

LEYDIG, VOIT & MAYER, LTD.

Jeffrey A. Wyand

Registration No. 29,458

Suite 300

700 Thirteenth Street, N.W.

Washington, D.C. 20005

Telephone: (202) 737-6770 Facsimile: (202) 737-6776

Facsimile: (202) 737-6776 Date: Mark U 1002

JAW:ves

PATENT Attorney Docket No. 401612/ASAHINA

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

AKIYOSHI et al.

Art Unit: Unassigned

Application No. Unassigned

Examiner: Unassigned

Filed: March 21, 2002

For:

WIRE ELECTRODE FOR WIRE

ELECTRICAL DISCHARGE

MACHINE

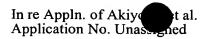
AMENDMENTS TO SPECIFICATION, CLAIMS AND ABSTRACT MADE VIA PRELIMINARY AMENDMENT

Amendments to the paragraph beginning at page 1, line 13:

In order to increase the machining speed, an example of a wire electrode for a wire electrical discharge machine, wherein core material (i.e., a core) is coated with a layer of Cu-Zn intermetallic compound, is disclosed in HITACHI CABLE REVIEW No. 18 (October 1999). A photograph of \underline{a} cross section of this wire electrode is shown in Fig. 8. The figure is a magnification of \underline{a} region near \underline{a} surface of the wire electrode, wherein the coating layer of Cu-Zn intermetallic compound covering the core can be seen. In Fig. 8, the β phase of the intermetallic compound is seen in a string-like pattern and is surrounded by the α phase. Moreover, the outermost region of the wire electrode consists of only the α phase.

Amendments to the paragraph beginning at page 1, line 24:

The β phase, which has higher Zn concentration than the α phase, has an advantage to increasing machining speed, because the β phase easily evaporates through discharges to blow out object material. On the other hand, the β phase is brittle in a sense of metallography and has a disadvantage that there easily occur cracks during a cold wire drawing process in manufacturing a wire electrode. Since the α phase with superior workability surrounds the β phase with difficult workability, a wire electrode as shown in Fig. 8 can be easily formed to be as a fine wire without any cracks or breaks during a cold wire drawing process.



Amendments to the paragraph beginning at page 2, line 6:

Further, a similar wire electrode for a wire electrical discharge machine is disclosed in Japanese Unexamined Patent Publication No. 300136/1997. Fig. 9 shows concentration of Zn in the radial direction of this wire electrode. Region The region near the surface of the wire electrode consists of the α phase and the Zn concentration is approximately 30 wt. %. In the case where Zn concentration exceeds 40 wt. %, there appears the β or γ phase having a different crystal structure from that of the α phase. At the α depth of 5 to 30 μ m from the surface of the wire electrode, the Zn concentration ranges from 35 to 45 wt. % where the α and β phases coexist and the Cu-Zn intermetallic compound with relatively high Zn concentration is formed.

Amendments to the paragraph beginning at page 3, line 3:

The present invention is made to solve the <u>above</u> <u>described</u> problems and an object thereof is to increase Zn concentration in the coating layer and to improve the machining speed. A further object of the present invention is to remove object material efficiently and improve the machining speed and accuracy of machining, by improving the rigidity of <u>the</u> wire electrode and suppressing the vibration during <u>discharge</u> machining.

Amendments to the paragraph beginning at page 4, line 4:

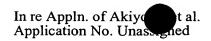
Fig. 4 is a graph showing a relationship between the thickness of a coating-layer 3 of Cu-Zn alloy in the α phase and machining speed;

Amendments to the paragraph beginning at page 4, line 7:

Fig. 5 is a graph showing a relationship between the thickness of a coating layer 2 of Cu-Zn intermetallic compound in other than the α phase and machining speed;

Amendments to the paragraph beginning at page 4, line 10:

Fig. 6 is a graph showing machining speed of a wire electrode for a wire electrical discharge machine according to embodiment 2 of the present invention, comparing compared with that of the conventional wire electrode;



Amendments to the paragraph beginning at page 4, line 14:

Fig. 7 is a graph showing machining speed of a wire electrode for a wire electrical discharge machine according to Embodiments 3 and 4 of the present invention, comparing compared with that of the conventional wire electrode;

Amendments to the paragraph beginning at page 4, line 18:

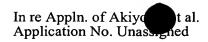
Fig. 8 is a magnified photograph showing <u>a</u> cross section of the conventional wire electrode for a wire electrical discharge machine; and

Amendments to the paragraph beginning at page 4, line 20:

Fig. 9 is a graph showing Zn concentration in a radial direction of <u>a</u> cross section of a conventional wire electrode for a wire electrical discharge machine.

Amendments to existing claims:

- 1. (Amended) A wire electrode for wire electrical discharge-machine characterized in that the wire electrode has machining including a-three-layered three-layer structure comprising an electroconductive electrically conductive core (1), a first coating layer (2) of Cu-Zn-intermetalic intermetallic compound in other than an α phase surrounding the core (1), and a second coating layer (3) of Cu-Zn alloy in the α phase on the exterior of the first coating layer (2), and that the thickness of wherein the second coating layer (3) is has a thickness in a range from 5 to 15 μm.
- 2. (Amended) The wire electrode for wire electrical discharge-machine machining according to Claim 1, characterized in that wherein the first coating-layer-(2) comprises Cu-Zn alloy in \underline{a} β phase.
- 3. (Amended) The wire electrode for wire electrical discharge-machine machining according to Claim 1,-characterized in that wherein the core-(1) comprises Cu-Zr alloy.
- 4. (Amended) The wire electrode for wire electrical discharge-machine machining according to Claim 2, characterized in that wherein the core (1) comprises Cu-Zr alloy.
- 5. (Amended) The wire electrode for wire electrical discharge-machine machining according to Claim 1,-characterized in-that wherein the core-(1) comprises Cu-Zn alloy.



6. (Amended) The wire electrode for wire electrical discharge-machine machining according to Claim 2,-characterized in that wherein the core-(1) comprises Cu-Zn alloy.

Amendments to the abstract:

ABSTRACT

The present invention aims to increase concentration of Zn in a coating layer to enhance machining speed. Moreover, the present-invention aims to perform removal of object material efficiently and enhance machining speed as well as accuracy in machining by increasing rigidity of the wire electrode to suppress-vibration thereof during machining process.

The present invention is characterized in that the $\underline{\underline{A}}$ wire electrode for wire electrical discharge machine is constituted as machining has a three-layered structure of an electroconductive electrically conductive core (1), a first coating layer (2) of Cu-Zn intermetaric intermetallic compound in other than an α phase, and a second coating layer (3) of Cu-Zn alloy in the α phase on the exterior of the first coating layer (2), and that the The thickness of the second coating layer (3) is set to 15 μ m. Furthermore, the The first coating layer (2) is preferably Cu-Zn alloy in $\underline{\underline{a}}$ β phase. Moreover, the The core (1) is preferably made of Cu-Zr alloy.